Syllabus

CEE 498FM: WATER RESOURCES FIELD METHODS

Summer Session II, 2007,
Class hour and location: 9:00 A.M.to1:00 P.M MWF, Newell Conf. Room, USGS Illinois Water Science Center
Laboratory: 9:00 AM to 4:00 PM Tu/Th, Newell Conf. Room, USGS Illinois Water Science Center, or as arranged for field trips
Credit: 3 hours

Instructors

Dr. Arthur R. Schmidt, P.E.
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Course Description: This course will emphasize: (1) scientific principles behind measurement technologies and protocols used for water-resources measurements; and (2) experimental design for field-scale water-resources and environmental studies. This course will include discussion sections where the theoretical bases and scientific principles of different measurements and sampling strategies will be discussed, along with several field trips to observe and participate in using the methods that have been discussed. The field trips will examine real-world problems (e.g., what is the anticipated effect of removal of a dam) and the monitoring that would be needed to support making decisions about such problems.

The instructors for this course will include experts from the U.S. Geological Survey, Illinois Water-Science Center, as well as Drs. Holmes and Schmidt

Prerequisites: Students should have the basic hydrologic and hydraulic background equivalent to CEE 350 "Water Resources Engineering," and TAM 335 "Introductory Fluid Mechanics". Students should have an introduction to probability and statistics equivalent to CEE 202, "Engineering Risk & Uncertainty."

Objectives: This course will provide both an overview on selected measurement technologies and protocols, as well as a broader perspective of measurement and sampling design for environmental problems. The learning objectives of this course are, that upon completion of this course:

1. The students will be able to analyze a complex environmental problem and develop an experimental design that will obtain data that adequately addresses the objectives of the study in a timely manner.
2. The students will comprehend the scientific principles behind the protocols and measurement technologies that are used for field-scale hydrologic and environmental studies and be able to apply this understanding to select appropriate instruments and methods from the complex assortment of available options. The students also will be able to apply this understanding use the selected instruments and protocols properly.
3. The students will be able to evaluate the sampling design, measurement technologies, and protocols used in a study and determine the adequacy of the resulting data to address hydrologic and environmental questions.

The first objective will focus on project planning. This will emphasize formulating scientific research that addresses hydrologic and environmental problems. This will highlight developing a clear statement of the objectives of the research, analysis of existing data to formulate hypotheses, and then development of an experimental plan to test the hypotheses.

Data from field-scale hydrologic and environmental studies may well be used to address questions beyond the scope of the original study. Therefore, this objective will address topics such as data reporting and recording of ancillary observations that may make the data more useful for future studies.

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The second objective will emphasize the scientific principles of various sensors, meters, and samplers. Common protocols for using different sensors, meters, and samplers to measure different properties and constituents will be examined to illustrate how the scientific principles are reflected in the protocols. The students will receive "hands-on" experience with common sensors, meters, and samplers in field settings.

The third objective will emphasize the quality of data and how data quality relates to the objectives of hydrologic and environmental studies. This will include basics of uncertainty analysis, sources of variability, comparability of data from different sources, "representativeness" and independence of data, and basics of hypothesis testing.

Illinois Compass - Course Web site: Supplemental instructional materials for this course will be delivered to you via Illinois Compass. Compass contains a variety of different modules, including supplemental references, various design manuals and manuals of practice, commonly used software, links to related web sites. Of particular importance, the Bulletin Board (Discussions), Calendar, and Announcements are available only through Compass. You are responsible for and expected to regularly check the Compass site for announcements and other important class information. The Uniform Resource Locator (URL) for the course is:

http://compass-pilot.uiuc.edu/

When you enter this URL into the Web browser (i.e, Netscape or Internet Explorer) a login box will appear. Follow the instructions on that page to log in. You will be using your campus NetID to login to Illinois Compass.

Course Outline:

I. Introduction, Experimental Design, Program Planning
   - A. Introduction, Measurement vs Calculation vs Estimation
   - B. Hypothesis testing and Experimental Design
   - C. Uncertainty and Error Analysis

II. Groundwater Measurements and Methods
   - A. Groundwater Hydraulics and Principles
   - B. Well Construction
   - C. Hydraulic Tests and Measurements
   - D. Groundwater-quality sampling

III. Surface-Water Measurements and Methods
   - A. Open-Channel Hydraulics
   - B. Measurement Principles

IV. Sediment Measurement and Methods
   - A. Sediment Hydraulics
   - B. Measurement Principles

V. Water-Quality Measurements and Methods
   - A. Water-quality principles—Measurement principles, chemical compatibility, quality assurance
   - B. Sample Collection—flowing and non-flowing water sites
   - C. Sample preparation
   - D. Field Measurements

Grades:
The evaluation of your performance in this class is based on the activities outlined in the table below.

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Class Project 80%		80%
Participation (attendance, in-class exercises, Compass use, etc) 20%		20%
TOTAL		100%

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Class Participation: I encourage you to pose questions and comments about the class material and relevant water-resources issues before, during, and after class. Various activities will be included during the lecture-discussion time to facilitate discussion with both the instructor and your peers. In addition, you are encouraged top use the discussion area on Illinois Compass to present your questions or comments to the class as a whole and to respond to the questions and discussions posted by your peers. In particular, the on-line discussion area is on-line student's greatest opportunity for participation. If you directly email questions to the instructor, you will be asked to post these to the Illinois Compass discussion area in order to facilitate interaction with your peers and to allow others to benefit from your questions and discussions. Twenty percent of your semester grade will reflect your participation in on-line and classroom discussions and exercises. [return to top]

Project: The project is based on a current local problem and will synthesize all of the material covered and data collected during the course. The project will be done individually. Each person will make an oral presentation of their design project to the class on August 6. Each individual also is expected to provide a written report no later than August 1, 2007. [return to top]

Statement of Academic Integrity: The *Code of Policies and Regulations Applying to All Students* will be applied in all instances of academic misconduct committed by CEE 498 FM students. This applies to all exams, assignments, and Illinois Compass materials distributed or used in this course.

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